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INTRODUCTORY REPORT OF THE EXECUTIVE DIRECTOR

ENVIRONMENTAL CONSEQUENCES OF THE ARMED CONFLICT BETWEEN IRAQ AND KUWAIT

I. INTRODUCTION

1. At the second special session of the UNEP Governing Council, held from 1-3 August 1990, the Council expressed "its concern over the invasion of Kuwait by Iraq and the resulting destruction of the environment and disruption of social and economic structures".

II. UNEP INITIATIVES

2. As his own personal concern over the actual and potential environmental effects of the military actions deepened and news of serious oil spills became known, the Executive Director consulted with his colleague, W.A. O'Neil, Secretary-General of the International Maritime Organization (IMO) on 28 January 1991 on urgent joint actions.

3. To set this process of inter-agency co-operation in motion, the Executive Director contacted all Governments concerned with the Iraq/Kuwait conflict, as well as other United Nations agencies and appropriate international organizations. This applied particularly to IMO, which had already initiated actions to assist its Member States in their response to the massive oil spills in the waters bordering Kuwait and Saudi Arabia. The United Nations agencies and organizations were then invited to participate in an urgent consultation in Geneva, while the Executive Director of UNEP remained in contact with the Governments concerned.

First United Nations Inter-Agency Consultation 1/

4. Accordingly, from 5-6 February 1991, the first United Nations inter-agency consultation was convened in Geneva to intensify co-operation and co-ordination within the United Nations system and optimize the diverse capabilities within it to enable it to respond rapidly to urgent requests from all Member States.

5. The need was recognized for a comprehensive and co-ordinating approach to the potential local and regional ecological, human health, and other social and economic consequences for the terrestrial, coastal and marine environments, as well as to the atmospheric effects.

6. The urgent need was also expressed for support of the Kuwait Action Plan of 1978 (a UNEP regional seas programme) through the revitalization of the Regional Organization for the Protection of the Marine Environment (ROPME) and the Marine Emergency Mutual Aid Centre (MEMAC) located in Bahrain. UNEP was recognized as having the lead role in the revitalization of ROPME - an organization enjoying the formal support of all eight States in the region and co-operating actively with United Nations agencies - and UNEP was requested to develop a framework of action for the region.

Expert mission to region

7. At the same time, the Executive Director sent a three-person expert mission to the region to make a preliminary impact assessment of the environmental situation in the conflict area, paying particular attention to the environmental problems posed by oil slicks, and to establish an effective structure for a continued flow of objective environmental information.

8. The environmental situation in the region is now being monitored by UNEP through its GEMS/GRID facility in Geneva and by IMO. IMO had already established a round-the-clock co-ordinating centre in London and had set up a similar centre in Bahrain. The World Conservation Union (IUCN) had also sent an observer to the region and is co-ordinating ecological information in conjunction with the World-wide Fund for Nature (WWF).

1/ United Nations agencies and other bodies represented at the two Geneva United Nations inter-agency consultations were: the Food and Agriculture Organization (FAO), the International Atomic Energy Agency (IAEA), the International Maritime Organization (IMO), the United Nations Educational, Scientific and Cultural Organization (Unesco), the Inter-governmental Oceanographic Organization (IOC), the United Nations Conference on Environment and Development (UNCED), the United Nations Development Programme (UNDP), the Office of the United Nations Relief Co-ordinator (UNDRO), the United Nations Environment Programme (UNEP), the World Health Organization (WHO) and the World Meteorological Organization (WMO). The following units within UNEP were represented: the Global Environment Monitoring System Programme Activity Centre (GEMS/PAC), Industry and Environmental Office (IEO), International Register for Potentially Toxic Chemicals Programme Activity Centre (IRPTC/PAC), the Co-ordinating Unit for the Mediterranean Action Plan (MEDU) and the Oceans and Coastal Areas Programme Activity Centre (OCA/PAC). Other organizations represented were: the World Conservation Union (IUCN) and the Regional Organization for the Protection of the Marine Environment (ROPME). Other United Nations agencies and organizations invited, but unable to attend, have been kept up-to-date on the results of the consultation.

9. Unesco and its IOC has also collected data and consulted several specialists from its roster of experts in regard to the biological and chemical effects in the region, the physical oceanography and dispersion, and the use of clean-up techniques.

Support for ROPME

10. In early February, UNEP also dispatched a senior staff member to Bahrain to help in the revitalization of the Regional Organization for the Protection of the Marine Environment (ROPME) and to assist ROPME in the implementation of its role in co-ordinating the activities of United Nations agencies, other organizations, and representatives of Governments providing assistance. The staff member remained in Bahrain until he recently joined the United Nations mission to Kuwait, where he and one other senior UNEP expert participated specifically in the assessment of environmental damage caused by the conflict in that country.

11. Additionally, on 22 February 1991, the Executive Director sent the Director of UNEP's Oceans and Coastal Areas Programme to UNEP's Regional Office for West Asia in Bahrain to help strengthen its ability to provide assistance to the region in the environment field and to present to the ROPME meeting a framework of action developed by UNEP. This framework received unanimous support from the ROPME meeting.

12. During this meeting, the Secretariat of ROPME presented a proposal for joint action to combat the oil spill in the region. The principal components of the proposal include surveillance, modelling, identification of sensitive areas, updating the inventory of personnel and equipment available for combating, containment, and removal of oil.

UNEP Action Plan and the Second United Nations Inter-Agency Consultation

13. Following the approval at the ROPME meeting of the UNEP framework of action, UNEP developed a draft action plan for the mitigation, elimination, rehabilitation and protection of the environment in the Kuwait Action Plan region. This draft action plan was presented to a second United Nations inter-agency consultation in Geneva on 15 March. The draft plan of action, based on the approved framework of action, was discussed, and approved. It envisaged placement of a Task Team core group in Kuwait by the middle of April and the completion of at least high priority surveys, assessments, and action plan designs within 90 days thereof.

14. The focus of the action plan is on four separate but interlinked areas: the coastal and marine environment, the atmosphere, inland terrestrial areas, and hazardous wastes. Of crucial importance to the success of the action is the establishment of a multi-disciplinary data-base, to be located - circumstances permitting - in Kuwait.

15. The activities proposed under the UNEP action plan are to be carried out in concert with other United Nations agencies and organizations, the Governments of the region, and other Governments providing assistance. Every effort will be made to build up on data and information already generated by teams currently operating the area.

Trust Fund

16. An estimated budget of between US$3.0 million and US$3.5 million will be required for the calculated number of person-months, equipment, etc. required. These moneys are expected to come from a special UNEP trust fund set up for this purpose. Coinciding with both the second Geneva United Nations inter-agency consultation and the informal ministerial consultation held in Nairobi from 11-13 March, the Executive Director of UNEP established a Special Trust Fund devoted exclusively to the financing

of the United Nations inter-agency action plan (excepting the activities by IMO, which are funded by a special IMO trust fund). A significant initial contribution of US$1.11 million was received from Japan, while a number of other States indicated that they, too, would contribute, either in cash or in kind, i.e. seconded experts, equipment, or data gathered by teams already operational in the region. Such timely action will be appreciated and recognized by the Governments of the region and will qualify the United Nations system to play an effective role in making the Governments of the region contribute substantially at a later stage in financing the detailed plan of action covering mitigation, elimination, rehabilitation and environmental protection of the area.

Funding for the implementation of the Plan

17. Funding needed for UNEP's co-ordinating function, in addition to support by the ROPME States, would have to be mobilized from donor countries and non-governmental and private institutions. This would be in addition to the Fund established by the Secretary-General of IMO for the special purpose of co-ordinating the cleaning activities of the oil spills. ROPME support will be indicated by the Organization's Council meeting tentatively scheduled for the end of June.

18. There is a need and possibility for an innovative global fund-raising mechanism, initially only for the environmental rehabilitation in this particular area, but subsequently for universal application in case of other environmental emergencies. The Executive Director of UNEP has initiated consultations with the parties concerned with a view to developing a proposal to this effect.

III. LEGAL ASPECTS

19. Environmental disruption is an inevitable concommitant of war. In many instances, this combat-associated disruption of the environment is an incidental outcome of hostile military actions. In other instances, it is an intentional component of a belligerent's strategy. The salient legal constraints on environmental disruption in time of war are summarized here, especially those that might apply to the Iraq/Kuwait conflict, together with and indication of their level of formal acceptance.

(a) The Haque Conventions II of 1899 and IV of 1907 on the Laws and Customs of War on Land

20. Both of these treaties commit their Parties - when in the role of occupying State - to safeguard the public buildings, real property, forests, and agricultural works of the occupied State, administering them according to the rules of usufruct. To date, approximately 31 per cent of all nations are Parties to one or both of these treaties (including four of the five permanent members of the United Nations Security Council), although not Iraq.

(b) Berne Protocol I of 1977 (additional to the Geneva Conventions of 1949) on the Protection of Victims of International Armed Conflicts

21. This treaty commits its Parties to take care in warfare to protect the natural environment against widespread, long-lasting, and severe damage. Prohibited, therefore, are methods or means of warfare that are intended, or may be expected, to destroy, remove, or render useless - for any motive - objects indispensable to installations, foodstuffs, crops, livestock, agricultural areas, and irrigation works. The Parties also agree not to attack dams, dikes, and nuclear electrical generating

stations, if such attack may cause the release of dangerous forces and consequent severe losses among the civilian population. To date, approximately 57 per cent of all nations are Parties to this treaty (including two of the five permanent members of the United Nations Security Council), although not Iraq.

(c) World Cultural and Natural Heritage Convention of 1972

22. The Parties to this treaty recognize that certain cultural and natural heritage sites and monuments are of outstanding universal value and constitute a world-wide heritage whose protection is the duty of the international community as a whole. The Parties undertake not to take any deliberate measures that might damage, directly or indirectly, any cultural or natural heritage situated on the territory of other Parties. To date, approximately 67 per cent of all nations are Parties to this treaty (including all five permanent members of the United Nations Security Council), and including Iraq, which at present has registered one such historic monument.

(d) Geneva Protocol of 1925 on Chemical and Bacteriological Warfare

23. The Parties to this treaty accept a prohibition of the use in war of all chemical agents, and also of the use of bacteriological methods of warfare. To date, approximately 73 per cent of all nations are Parties to this treaty (including all five permanent members of the United Nations Security Council), and including Iraq.

(e) Environmental Modification Convention of 1977

24. The Parties to this treaty undertake not to engage in military or any other hostile use of environmental modification techniques (i.e., deliberate manipulations of natural processes) having widespread, long-lasting, or severe effects as the means of destruction, damage, or injury to other Parties. To date, approximately 32 per cent of all nations are Parties to this treaty (including three of the five permanent members of the United Nations Security Council), although not Iraq.

(f) Proposed action by the Governing Council of UNEP

25. It is obvious that all these treaties need to be thoroughly reviewed particularly (e). The Governing Council may wish to recommend to the General Assembly that it review this treaty and consider strengthening it.

IV. INFORMAL MINISTERIAL CONSULTATION

26. At the Informal Ministerial Consultation held in Nairobi from 11-13 March 1991, the Executive Director invited discussion on environmental aspects of the Iraq/Kuwait conflict. Profound appreciation was voiced by the participants for the UNEP initiatives. They suggested that UNEP should play a principal role in the co-ordination of the activities related to the mitigation of the environmental damage caused by the conflict. There was also general support for the idea of a United Nations system for dealing with environmental emergencies and UNEP was encouraged to set up an international register of suitable experts and equipment required in cases of environmental emergencies, as well as a register of areas of ecological risk. UNEP was also urged to ensure the inclusion in any post-war arrangements of both the environmental and economic aspects of hostilities.

27. Furthermore, it was emphasized that transboundary effects of the conflict should be addressed, while existing legal instruments pertaining to the use of the environment in war be closely examined. It was also proposed UNEP should also have the flexibility to respond in future cases

of environmental emergencies, for instance through larger fund programmes rather than being forced to establish special trust funds. The need for the capability to anticipate and avoid environmental problems was strongly underscored.

THE IRAQ/KUWAIT CONFLICT - THE ENVIRONMENTAL CONSEQUENCES

28. A special UNEP mission visited Saudi Arabia from 4-14 February 1991, at the time of the major oil slick off the east coast of that country. In March, two UNEP staff participated in a United Nations mission to Kuwait. UNEP's role in this mission was to carry out a first rapid reconnaissance survey of the post-conflict environmental situation in Kuwait. The UNEP team was in Kuwait from 16 March - 2 April 1991, during which time it visited, or carried out survey flights over, most of the country. The following report is based primarily on the findings of these missions, supplemented by other reliable information that has subsequently become available by 24 April.

Oil fires

29. The burning of the oil wells in Kuwait is the most widely known and obvious consequence of the Iraq/Kuwait conflict. Estimates of the number of wells that were burning vary from 500 to 650. The UNEP mission felt, however, that this might be an underestimate and that perhaps 700 or more wells were alight when the oil field fires were at their maximum. Oil industry experts considered that at the period of maximum conflagration, four to six million barrels of crude oil were being consumed daily - roughly twice the normal daily production. This figure is likely to have been greatly reduced by now.

30. Since initial ignition, the oil field fire situation has been gradually changing. Many wells are, unaided, diminishing their burn rate or are extinguishing themselves due to natural induction of ground water in a process known as "coning". At the time of the mission's departure it was estimated that some 40-50 well fires had gone out and that many more were in the process of going out.

31. This natural extinguishing process posed a new environmental problem that came into prominence during the course of the mission. Wells no longer burning continued to gush onto the land large quantities of oil that converged to form large oil lakes. At one time torrents of oil overran the land - oil erosion was seen by the mission - and it seemed that this surface oil would make its way down natural drainage lines to the sea, thus posing a new threat to the marine environment. In an effort to curtail this oil flow, attempts were made to relight some of the wells that were no longer burning. This had limited success and, to the mission's knowledge, only six wells were actually reignited. The surface oil flow was finally controlled by containment through construction of earth dams and berms. It will not finally be overcome until the flow of all the gushing wells is stopped through capping. At the moment, capping is proceeding at an estimated rate of 8-10 wells per week.

32. Emissions from the burning wells take two forms: the visible soot and particulates and the invisible gases. Each oil field has its own smoke plume (as does each wellhead fire), which is directed by the lower level winds and so act as weathervanes about the oil field according to wind direction. The plumes gradually rise through the lower atmosphere until, in general, they reach an upper surface at about 1,800m. and a lower surface at about 1,000m. At a 1,000 km. distance, the plume width, judging from satellite images can be several hundred kilometres wide. At present, the plumes do not seem to be rising to more than 4,500-5,000m., though

there are almost certain to be local emission spikes rising above this level. Wind directions at different levels above the ground may at times cause different elements of the plumes to move in different directions in a complex pattern.

33. Oil smoke is particularly efficient at absorbing solar radiation, so that in the centre of areas covered by the plumes, there is little or no light and air temperature can be depressed by 10°C or more. The weathervane effect, however, means that the same area of ground or water is not covered by the plumes for very long. At the moment, emissions do not seem to have reached upper atmospheric levels, so any cooling effects are likely to be local, or perhaps regional, but not global, in extent. There is also constant fall-out of particles along the length of the plumes, so that only the smallest particles remain at the extreme limits of the plumes.

34. There are still few good measurements of the contaminant content of the air in the oil fields and in surrounding regions affected by the smoke plumes. Those that have been made suggest that there has been a slight increase in levels of sulphur compounds, carbon monoxide and total hydrocarbons, bringing them to about the same levels as those found in Kuwait before the fires started. Kuwait at that time, however, had an active oil processing industry, other commercial activities and many cars - a situation that differs from that of today. The southern oil fields, particularly Wafra, differ from the others in that they are known to be producers of hydrogen sulphide and sulphur dioxide and it is likely that the main releases of these substances will come from the southern fields. As yet there are no available ground measurements from the southern area.

35. There are insufficient data to be able to state with any certainty the probable effects of exposure to these smoke plumes on human and ecosystem health. At the moment, knowledge is limited to a few measurements taken in the field, data from some fixed ground stations in Kuwait City, and data taken in the smoke plumes by a research aircraft. The latter recorded sulphur dioxide levels of 1,000 ppb. in part of the plumes 100 km. downwind of the source. Such levels could cause problems for asthmatics or those with other respiratory problems if the plumes were wafted to the ground; most healthy people could endure such exposure without damage to health. Although there may be acidic rainstorms, these are unlikely to pose a long-term problem to the soils and waters of the region, which would require repeated exposure to acidic deposition before they became significantly affected.

36. Frequently repeated good air contamination measurements at ground level in a number of locations, as well above ground within the plumes, remain essential and must be given the highest priority.

Oil in the sea

37. Shortly after 22 January 1991, there was a massive release of crude oil into the sea from the Kuwait Oil Company Sea Island terminal off Al-Ahmadi and from three oil tankers anchored off the North Pier. Together, these releases amounted to some 10 million barrels of crude oil. Further release of oil was prevented by the bombing of the Al-Ahmadi tank farm loading manifolds, the Sea Island terminal and one of the tankers.

38. A USA National Oceanic and Atmospheric Administration (NOAA) satellite image taken on 25 January shows a smoke plume from the damaged Sea Island terminal and the oil slick, by this time some 50 km. long and 8 km. wide. Assuming an average thickness of 0.5 cm. for the slick, its total volume could have been about 13 million barrels - more than enough to contain the

10 million barrels thought to have been released. As this slick moved down the Kuwait coast toward Saudi Arabia, it rapidly lost much of its volume by evaporation and by extensive dispersal in the form of sheen - a fine surface film of oil.

39. On 24 January, this slick was reportedly observed entering Saudi Arabian territorial waters in the region of Khafji (28°25'N). South of the Saudi Arabian-Kuwait border, it was augmented by oil from the loading terminal and other installations damaged during military operations at Khafji at the end of January and the beginning of February. ARAMCO estimates put the Khafji oil release at between 100,000 and 500,000 barrels.

40. On 7 February, the UNEP mission overflew the oil slick off the coast of Saudi Arabia and estimated its total volume as being about 1 million barrels. The slick was then 120-130 km. long and 5-25 km. wide, broken into several patches and bands. By 11 February, the slick extended along the coast of Saudi Arabia from 28°15'N (just to the north of Mishab) to Abu Ali island (27°20'N). A fortunate combination of winds and currents have kept this slick more or less stationary within these limits so that very little oil has moved beyond Abu Ali island towards the southern parts of Saudi Arabia and other countries to the south. The affected coast of Saudi Arabia has, however, been severely impacted, although sufficient steps were taken to prevent damage to important desalination and industrial plants. So far, some 400,000 barrels of crude oil have been recovered from this slick.

41. At the time of the UNEP mission (February 1991), it was not possible to overfly Kuwait waters for security reasons, so it remained conjectural as to whether there were further oil slicks in the region. Subsequent surveys, including those of the UNEP team, which was part of the United Nations mission as of 2 April, failed to find any extensive oil slicks, although there were patches of sheen.

42. The aerial survey of the coast of Kuwait and its off-shore waters (20 and 22 March 1991) showed no indication of massive fouling of beaches by oil. In only a few scattered sites along the coast were oil traces and deposits found. Some 10,000 barrels of oil were in the commercial harbour at Shuaiba; this had resulted from a separate secondary release from Shuaiba harbour off-loading facilities, including a waste oil storage tank, that took place in late February. Patches of sheen were noted along the coast where winds and currents had driven them against peninsulars.

43. The mission, however, did find that there was an extensive film of particulates on the water surface, which formed into bands and whorls very like an oil slick. These particles almost certainly came from the smoke plumes from the oil well fires. Their impacts on coastal and marine ecosystems are not known. It was noted, however, that one tide could cover a beach with black particulates that the next tide would remove, leaving the beach clean. It is possible that these particulate patches - which are extensive - are being mistaken for oil slicks.

Land degradation

44. The conflict in Kuwait led to three main types of land degradation:

(a) Defensive constructions such as hardened gun emplacements, hardened personnel shelters, tank and mortar revetments, dug-in ammunition dumps, fuel bowser pits and a wide variety of fences, trenches and shelters. Trenches filled with oil to be lit during battle were a special feature of the Kuwait conflict;

(b) Off-the-road vehicle movement results in tracks that break up both the vegetation cover and the upper soil layers, which can lead to erosion by wind and water where such damage has been severe; there will almost certainly be an increase in the amount of wind-blown material contributing to an increase in the severity of sandstorms during the season in which they are prevalent. In some cases, however, especially on gentle gradients, such tracks can result in better rainwater penetration within them and so to subsequent improved plant growth;

(c) Explosion damage from bombs, missiles and shells result in craters. Bomb and shell craters tend to occur in localized groups. In each crater the vegetation is removed and the upper soil layers removed or rearranged. In some cases, however, such craters fill with water, become centres of habitat diversity, and act as small wildlife refuges. Craters with water, algae and increased plant growth were seen.

45. The country was surveyed, mainly by air, to determine the severity of impact resulting from these three types of land damage.

46. Much of the coast has been very severely damaged by these causes, though there are areas, particularly in the north, where such effects are slight to moderate. In general, the south and the north have been affected most, the south by defensive constructions, the north by off-the-road tracks resulting from armoured vehicle movement and battles. The extreme west and southwest of the country and Bubiyan Island in the northeast have hardly been affected by this sort of damage.

Unexploded ordnance

47. Mines and other unexploded ordnance pose one of the most serious and potentially long-lasting threats to the environment of Kuwait. Vast minefields were laid along all the coasts and in broad bands across the south of the country. Ports and harbours are faced with extensive sea minefields. In addition to the minefields, unexploded ordnance is widespread, being scattered around every site where there was conflict, even if only a few armoured vehicles were involved. With few exceptions, these conflict sites are unmapped. At the time of the mission, two to five people were admitted daily to Kuwait City hospitals with explosion injuries - mainly to arms and legs. During the mission, the military unexploded ordnance clearance operation within Kuwait celebrated the removal of the 3,000,000th explosive item.

48. Mine clearance operations are not always totally successful and a danger from missed items always remains. In Kuwait this will be most serious in the coastal zones, which form the main recreational areas for the people.

49. It may not be possible to clear the huge minefields in the south, large areas of which may have to be securely fenced and left. If this is done, it will be essential to leave really safe passages through these minefields, made at intervals to allow nomadic peoples and their livestock to move seasonally.

Agriculture and fisheries

50. Agriculture and fisheries were important but small parts of the economy of Kuwait. At the time of the mission, both were at an almost complete standstill. The vital irrigation system was not functioning, so that even perennial crops were threatened and might not survive the coming summer without irrigation water. The majority of livestock perished, and those that did survive are being hard hit by the consequences of the oil fires and consequently may not survive. Fishing activities have almost ceased because fishing boats and fisheries equipment were either destroyed or taken away. Marine minefields effectively prevent fishing at present.

Infrastructure

51. The environment and environment-related infrastructure of Kuwait ceased to function, and in many areas, disappeared. Equipment, large and small, was destroyed or taken away. It will take some time before any environment-related sector will regain the importance it had before the conflict. Restoration of these services and facilities must be a priority for Kuwait because of the nature of the oil industry upon which it depends and the potential of that industry for impacts on the environment.

VI. MAIN CONCLUSIONS AND RECOMMENDATIONS

52. Although an objective and accurate assessment by UNEP of the environmental problems resulting from the hostilities is to this day seriously hampered by restrictions on free access to many parts of the sea area and the as yet classified nature of some relevant information gathered by the military, it is recommended:

- To further enhance co-operation, greater involvement and utilization of skills and resources of both the United Nations agencies and organizations and Governments willing and able to provide expertise and resources;

- To further revitalize the Regional Organization for the Protection of the Marine Environment (ROPME), an organization comprised of the States around the sea, and strengthen its secretariat to deal with the war-related regional environmental problems;

- To carry out immediate surveys of the conflict area to identify all smoke emission sources, categorizing them by type and expected burn duration, if left, as well as to carry out ecological surveys of the conflict zone as soon as possible in order to ascertain the extent of the ecological damage caused. This should include specialized ground and air surveys of the coastal area of the region, paying particular attention to those areas affected by amphibious landings. Based on these surveys, appropriate remedial activities and programmes should be designed and put in place over the following two to three years. These should involve the establishment of a specialized data-base;

- That national environmental monitoring and assessment centres should be set up in each country to ensure that environmental and resource data are fed into the planning and decision-making processes of each Government concerned;

- That, as soon as the situation permits, there should be an immediate survey of all known nuclear, biological and chemical warfare manufacturing production centres in the area to ensure that there has been no contamination of adjacent and other areas;

- To maintain close liaison with the military of the conflict participants to locate and demarcate all mine fields, including those at sea, for the subsequent clearance of these areas. The initial survey should be completed within six months, the clearance operations within three years;

- That information be obtained, now scattered and some of it inaccessible, about the risk from release of hazardous chemicals from damaged industrial plants.